Unconsolidated Aquifer Systems of Dubois County, Indiana

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Five unconsolidated aquifer systems have been mapped in Dubois County: the Dissected Till and Residuum; the Alluvial, Lacustrine, and Backwater Deposits; the White River and Tributaries Outwash; the Buried Valley; and the Coal Mine Spoil. The first four aquifer systems comprise sediments that were deposited by glaciers and their meltwaters, or are thin, eroded residuum (a product of bedrock weathering). Boundaries of these aquifer systems are commonly gradational and individual aquifers may extend across aquifer system boundaries. The Coal Mine Spoil Aquifer System is man-made and most boundaries are well defined.

In northwestern and central portions of the county, there is as much as 160 feet of unconsolidated material overlying the bedrock. This contrasts with most other areas in the county, especially in the eastern and southern parts, which have 20 feet or less of unconsolidated material overlying bedrock. In places, sand and gravel aquifers are located immediately above the bedrock surface. Sand and gravel aquifers occur in the main valley of the East Fork White River, in a deeply buried bedrock valley in northwestern Dubois County, and in some smaller buried bedrock valleys that commonly coincide with present-day valleys.

Dissected Till and Residuum Aquifer System

The Dissected Till and Residuum Aquifer System, which covers much of the southern and eastern portions of Dubois County, has the most limited ground-water resources of the unconsolidated aquifer systems in the county. Unconsolidated materials of the Dissected Till and Residuum Aquifer System consist of thin, eroded bedrock residuum in most of the county. The residuum has a high clay content and is typically less than 15 feet thick. However, in the northwest quarter of the county the system includes some pre-Wisconsin till, lacustrine silt and clay, and Wisconsin loess. In a few areas a thin sand layer, typically less than 5 feet thick, is encountered. Total thickness of the system in Dubois County typically ranges from about 5 to 50 feet.

Because the unconsolidated materials covering the bedrock are so thin in most places, the aquifer elevations closely match the elevation of the bedrock surface. Therefore, the highest aquifer elevations are in the southeastern part of the county and the lowest elevations are in the northwestern part of the county. Static water levels in wells developed in these aquifers range from 12 to 41 feet beneath the land surface, but are commonly from 10 to 20 feet beneath the surface.

Well yields range from 0 to 15 gallons per minute (gpm), but yields of 0 to 5 gpm are more typical. Dry holes are common. Large-diameter bored (bucket-rig) wells may produce water from thin sands within the predominantly clay and silt materials of this aquifer system. With the exception of the northwest quarter of the county, this aquifer system has extremely limited

potential for successful wells. The Dissected Till and Residuum Aquifer System is transected by the Alluvial, Lacustrine, and Backwater Aquifer System and the Buried Valley Aquifer System. The boundaries between theses systems are transitional in many areas of the county. Because of the low permeability of the surface materials, this system is not very susceptible to contamination from surface sources.

White River and Tributaries Outwash Aquifer System

In Indiana the White River and Tributaries Outwash Aquifer System occupies the valleys of the White River and its major tributaries. However, in Dubois County this aquifer is limited to the main valley of the East Fork White River. This valley is the only present-day valley in the county that carried outwash from the melting glaciers far to the north.

The system contains large volumes of sand and gravel that fill the main river valley. As the glaciers melted, the sediment contained within them was delivered to the East Fork White River in quantities too large for the stream to transport. As a result, the increased sediment load was stored in the valleys as vertical and lateral accretionary deposits. As long as the retreating glaciers continued to provide sediment in quantities too large for the stream to transport, the valley continued to be filled. This valley-filling process formed the most prolific aquifer system in the county.

The sand and gravel deposits of the White River and Tributaries Outwash Aquifer system range from less than 20 feet to more than 81 feet in thickness. This aquifer system, with its thick sand and gravel, contrasts sharply with the adjacent aquifer systems, which show little or no sand or gravel. However, not all of the sand and gravel is saturated with water. Actual aquifer thickness of the White River and Tributaries Outwash Aquifer system ranges from about 18 to 64 feet, but most of the system has an aquifer thickness between 20 and 60 feet. Static water levels typically range from about 8 to 21 feet below land surface. Because water levels may occur near the base of an overlying fine grained clay, silt, or muddy sand the aquifer could be under confined or unconfined conditions.

The elevation of the modern East Fork White River floodplain is approximately 450 feet m.s.l. upstream where the river enters Dubois County and approximately 435 feet m.s.l. downstream where it leaves the county. Accurate elevations of the top and bottom of the aquifer itself are hard to determine because there are not many records available for wells completed in the aquifer. However, several records do show 10 to 30 feet of clay or muddy sand and silt above the aquifer. The bottom elevation of the aquifer is expected to range from about 300 to 325 feet m.s.l. in that part of the valley where the depth to bedrock is greatest.

The White River and Tributaries Outwash Aquifer system is by far the most productive aquifer system in the county and has the potential to consistently meet the needs of high-capacity water users. Well yields of 300 to 1000 gpm can be expected throughout most of the system. This aquifer system is highly susceptible to contamination in areas that lack overlying clay layers. Areas within the system that are overlain by thick layers of clay or silt are moderately susceptible to surface contamination.

Currently there are no registered significant ground water withdrawal facilities in the county. However, Haysville Water Utilities did have two wells that were tested at 200 and 278 gpm. The wells were discontinued in 1996.

Alluvial, Lacustrine, and Backwater Deposits Aquifer System

The Alluvial, Lacustrine, and Backwater Deposits Aquifer System is composed of unconsolidated deposits in valleys tributary to East Fork White River, Patoka River, and Ohio River. Included are deposits in the main valley of Patoka River. Also included are deposits over a broad area of northwest Dubois County. The unconsolidated deposits in this aquifer system come from two sources. One source is alluvium deposited by the stream along with colluvium eroded from the valleys walls and upland areas. The second source is glaciolacustrine deposits that were formed in bodies of relatively stagnant lake water, and are marked by soft silt and clay. These lake deposits were formed when the major valleys of the Wabash River, White River, and Ohio River were choked with coarser material carried by glacial meltwater. Thick deposits of this material effectively dammed tributary streams, creating lakes. Thick deposits of silt, sometimes called "slackwater clay", mark the former locations of these glacial lakes. These lacustrine deposits are commonly noted on Quaternary geology maps and soil maps. They can occur up to an elevation of 520 or 530 feet mean sea level (m.s.l.) in the county.

There are areas in this system where the thickness of unconsolidated materials exceeds 100 feet, for example in the main Patoka River valley south of Jasper and adjacent to the Buried Valley Aquifer System northwest of Jasper. Wells drilled in these areas may yield sufficient water for domestic needs; however, very little data are available. Because the Patoka River above Jasper never carried outwash from melting glaciers, it is doubtful that its main valley has the potential for much more than domestic wells. Well data for many of the smaller alluvial valleys is very sparse. Very little alluvial material is expected in the narrow bedrock-walled valleys.

The overall scarcity of productive zones of sand and gravel in this aquifer system is apparent from the number of water wells completed in the underlying bedrock aquifers. Sand and gravel lenses, where present in this aquifer system, are commonly less than 5 feet thick and are confined within the glaciolacustrine deposits, or are directly overlying bedrock. Large-diameter bored (bucket-rig) wells are often employed when other means of extracting seepage from the fine-grained deposits are not available. Wells that penetrate the Alluvial, Lacustrine, and Backwater Deposits Aquifer System commonly have depths that range from 28 to 60 feet, but some have depths of up to 120 feet. Static water levels in wells penetrating the aquifer system are typically less than 25 feet below the land surface. Yields from domestic wells range from 0 (dry holes) to 60 gpm. Overall, prospects of completing high-capacity wells in this aquifer system are poor. This aquifer system is marked by thick deposits of soft silt and clay that have low susceptibility to surface contamination.

Buried Valley Aquifer System

The Buried Valley Aquifer System consists of aquifer materials deposited in pre-glacial bedrock valleys in the county. During valley development, layers of bedrock were eroded to create valleys that were subsequently filled with unconsolidated glacial sediment of variable thickness.

Although there are additional buried bedrock valleys in Dubois County, only the larger buried valleys that contain significant water-bearing sediments have been included as mapped units of the Buried Valley Aquifer System.

There is only one significant buried bedrock valley located in Dubois County. It cuts as deeply as 150 feet into Pennsylvanian (Raccoon Creek Group) bedrock. It enters the county at the East Fork White River about a mile east of Portersville and trends south and southwest toward Ireland. At a point about one mile north of Ireland it turns northwest and exits into Pike County near Otwell. Wells in the Buried Valley Aquifer System are completed at depths ranging from 30 to 153 feet, although well depths ranging from 90 to 145 feet are most common. Static water levels in the wells range from 8 to 48 feet below the ground surface, but static water levels between 20 and 40 feet below ground surface are most common. Domestic wells typically yield from 5 to 50 gpm. No high-capacity wells are completed in this aquifer system. Although the potential exists for wells yielding up to 200 gpm or more, a major limitation is the fine-grained, dirty nature of the water-bearing sand units occurring in many places.

The Buried Valley Aquifer system has a low susceptibility to surface contamination because tills and lacustrine silts and clays generally overlie outwash sediments occurring within the bedrock valleys. Although lenses of outwash sand and gravel may occur within the tills, the predominance of fine-grained sediments above the bedrock valleys limits the migration of contaminants from surface sources to the deep aquifers.

Coal Mine Spoil Aquifer System

The Coal Mine Spoil Aquifer System covers but a small percentage of Dubois County, primarily because the coal seams (within the Raccoon Creek Group of Pennsylvanian age) in the county are too thin and sporadic to be of great commercial significance. This aquifer system was formed during the process of mining coal by surface-mining methods. The overburden was typically broken up by blasting and moved aside to uncover the desired coal seam. The overburden, most of which was originally solid rock, became a heterogeneous mixture of particles ranging in size from clay, silt, and sand up to gravel, slabs, and boulders. Where extensive these spoil areas contain considerable amounts of ground water. Although data are sorely lacking on permeability of these spoil materials, it is generally accepted that the spoil permeability is greater that that for most of the original rock layers above the coal seam mined.

The quality of ground water in this system is generally much poorer than that in the overburden before mining took place. Typically a significant increase in total dissolved solids, especially calcium, magnesium, bicarbonate, and sulfate, occurs. High iron, and sometimes low pH, can also severely limit potential uses of ground water from this system.

The Division of Water has no records of any water supply wells completed in this aquifer system in Dubois County.

Registered Significant Ground Water Withdrawal Facilities

Currently there are no registered significant ground water withdrawal facilities using unconsolidated aquifers in the county. Haysville Water Utilities had two supply wells in the White River and Tributaries Outwash Aquifer System, but these were discontinued in 1996. Refer to Table 1 for some details on the wells and to the map for facility locations. The only currently registered significant withdrawal facilities draw water from either reservoirs or rivers. The water is used for irrigation, public water supply, energy production, and industry.

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